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ABSTRACT

Students (N=78) enrolled in either the Fall, 1989 or Spring, 1990 semester of an urban university campus were studied to determine their preference for either the Personalized System of Instruction (PSI or Keller Plan) or the traditional lecture class in an undergraduate self-paced statistics class. (This was also the first self-paced course that 82% of the sample had ever taken.) Analysis of the results from a 13-item questionnaire revealed that 90% of the students liked the idea of frequent testing, 92% thought the use of student proctors was a good idea, 74% liked the idea of self-pacing, and 97% agreed that being able to retest a unit was a good idea. In addition, 50% indicated they were anxious about the self-paced format, yet 65% were confident they could manage their time and progress through the course. Also, 82% thought the grading was fairer to the student than in most lecture courses and did not feel it was harder to achieve a good grade under the self-paced system. Actual grades revealed only 5% of the students studied received a grade lower than C for the course. Contains 11 references. (GLR)

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STUDENT ATTITUDES ABOUT A SELF-PACED UNDERGRADUATE STATISTICS CLASS

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INTRODUCTION

Two decades ago, Fred Keller (1971) developed a method of individualizing instruction that he called the *Personalized System of Instruction* (PSI). Others frequently refer to it as the *Keller Plan*. The concept of a personalized system of instruction is an extension of programmed instruction, which has its roots in operant conditioning.

PSI replaces conventional instructional methods (lecture) and requires students to be in charge of their own learning. Keller's rationale for developing this alternative mode of instruction was his belief that learning is an individual phenomenon, not a group phenomenon (Chance, 1984). The traditional group method of lecture assumes that all students are the same. Therefore, presentation rate and difficulty level are constant for all students in the group. The most important component in a personalized system of instruction, student self-pacing, eliminates this problem.

Keller indicates that traditional methods of instruction generally require the student to be passive, limit student-teacher interaction, delay reward for studying, and cover instructional units which are too large (Chance, 1984). Therefore, Keller designed his instructional method to feature not only self-pacing (within limits, students can go as fast or slow as they choose), but a mastery orientation (students move to a new unit only after mastering the previous unit to criterion), and student control of the examination schedule (students take tests when they decide that they are ready and may repeat tests as often as they need to until they reach criterion) (Keller, 1971).

Because of the limitations of traditional methods of teaching, PSI's design incorporates effective attributes from several teaching methods. Like programmed instruction, the primary teaching mode is the written word. The use of printed textbooks, workbooks, audio-tutorial lessons, films, and computer-assisted instruction are all mediums that the instructor can use to provide students with self-study resources. According to Keller (1971), these various mediums are not to be equated with the course itself. They are only options which are available to the instructor.

Like the lecture, PSI gives the instructor the prominent role in selecting and analyzing the material to be learned, organizing and deciding how the material will be presented, constructing various questions based upon the material, and arranging the contingencies of reward which are essential to the learning process. The instructor's function is to be the course manager and provide a good learning environment (Chance, 1984). This is made possible by the use of student proctors. Because of the vast amount of paperwork that is generated by unit tests and retesting, student proctors are used to handle the distribution and grading of all tests. This allows the instructor to spend more time with students on a personalized and informal basis, like a discussion class would allow.

PSI also incorporates attributes from the current method of mastery learning. Unit perfection before advancing, retesting as necessary, and criterion-referenced testing/grading are essential components in both mastery learning and PSI course formats (Slavin, 1988).

Even though PSI was originally developed for use in a college psychology course, it has been used effectively in a variety of college courses (McKeachie & Kulik, 1975). Within these various courses, hundreds of studies have been conducted comparing PSI and traditional teaching methods on student's attitudes about the course. These studies indicate that PSI is popular with students, or at least with those who enroll in PSI courses (Robin, 1976; Gray, et.al., 1986; Smith, 1987). These students enjoyed the self-pacing, the opportunities for individualized tutoring from proctors, and the contract options that guaranteed specified grades in exchange for specified levels of performance (Robin,1976; Smith, 1987).

Kulik, Kulik, and Cohen (1979) also found differences in their meta-analysis on student's rating of PSI and control classes. Students rated PSI classes as more enjoyable, more demanding, and higher in overall quality and contribution to student learning than conventional classes. Students were more satisfied with self-paced courses than with lecture/discussion courses, even though self-paced courses may not necessarily be a more effective way to learn (Buerkel-Rothfuss & Yerby, 1982; Lamal, 1983; Tatum, 1985).

No two PSI courses are identical. All, however, will include the identified components in forms similar to those described above. The final product is a student-manageded learning environment which is in sharp contrast to the instructor-centered orientation of the typical lecture class (Ross, 1981).

Fundamentals of Applied Statistical Methods is an undergraduate statistics course that uses a modified Keller Plan. It differs from a traditional Keller Plan by assigning grades to students at the end of each semester, as opposed to allowing students continue with the course material until all units have been completed. The course was developed to be an elective for undergraduate education majors beginning in 1976. In 1979 the course became a requirement for students in the medical records and nursing programs. The textbook and other materials for the course were designed by the instructor specifically for use in this self-paced format. The course is offered during the Fall, Spring, and Summer sessions of the academic year. The course has only one formal meeting as a group. This takes place on the first scheduled day of class, which is designed to be an orientation session. Students are instructed to meet with the proctor or instructor periodically for help sessions and to take unit tests.

This study looks at attitudes of students on an urban university campus. Because most of these students work full-time and commute to class, self-study resources had to be designed so the student could study them at home. Which orientation, PSI or a traditional lecture class, do these students enrolled in the undergraduate self-paced statistics class prefer and what aspects of the self-paced class do they like the most? If there is a preference for one method, is it due to a possible end-of-term or final-grade effect?. This study will address these questions and determine if PSI is as viable for today's college student as it was twenty years ago.

METHOD

Seventy-eight students were selected to be subjects in this study. Each student was enrolled in either the Fall, 1989 or Spring, 1990 semester. The students were mostly female undergraduate students enrolled in nursing, medical records or educations majors. The education majors were taking the class as an elective rather than a required class. The students selected for this study were given a copy of a questionnaire to complete when they came to a help session or to take a unit test.

The questionnaire that was developed was designed to elicit respondent's attitudes about the self-paced statistics course. The questionnaire contained 13 items, 11 of which were arranged in a five-point Likert scale ranging from strongly agree (1) to strongly disagree (5). The middle option (3) was neutral. Subjects were asked to indicate their degree of agreement or disagreement about each statement. Several of the statements were designed to determine what student's attitudes were about specific components of the class structure and if they preferred a traditional lecture class. Other items addressed student's feelings about their ability to succeed with this type of course structure. One of the questionnaire items was a dichotomous (yes/no) item asking the respondent to indicate if this was the first self-paced course they had taken. The last question was a self-reported grade that the

student expected to earn from the course. At the end of the Fall and Spring semester, the actual grades for the students participating in the study were recorded.

RESULTS

A frequency distribution of results was constructed and analyzed (Table 1). This was the first self-paced course for 82 percent of the sample. Results indicated generally positive attitudes about the self-paced course. This was determined based on the composite attitude score of 22.6. This score could range from 11, which would indicate strong agreement with all items, to a score of 55, which would indicate strong disagreement.

Questionnaire items that elicited responses about the specific components of PSI were very favorable: 90 percent of the students liked the idea of frequent testing, 92 percent thought the use of student proctors was a good idea, 74 percent liked the idea of self pacing, and 97 percent agreed that being able to retest over a unit was a good idea. Fifty percent of the students indicated that they were anxious about the self-paced format, 79 percent indicated they knew how to study for this type of course, and 65 percent were confident

that they were able to manage their time and progress through the course. Eighty-two percent of the students indicated that the grading system in this course was fairer to the student than in most lecture courses and that they did not feel that it was harder to get a good grade under the self-paced system.

The results of a correlation analysis (Table 2) indicated the item which had the highest correlation with the composite score was that concerning whether students liked the idea of self-pacing ($r=.794$, $p<.01$). Students who liked the idea of self-pacing (74 percent), did not prefer a traditional lecture course (item 5), did not believe it would be harder to get a good grade with self-pacing (item 11), were more certain how to study for this type of course (item 7), were more confident that they could manage their time to progress through the course (item 3), believed that they would get personal treatment from the instructor and proctors (item 10), and indicated that the grading system in self-pacing was fairer to the student than in most lecture classes (item 9).

Student's preference for a traditional lecture course was the item that has the second highest correlation with student's composite attitude score ($r=.765$, $p<.01$). Students who did not prefer a traditional lecture class (70 percent), had the same significant relationships with items on the questionnaire as those students who indicated that they liked the idea of self-pacing.

Students perception of how hard it is to get a good grade with this type of class format was the item which had the third highest correlation with the composite attitude score ($r=.729$, $p<.01$). Students

who indicated that it was not harder to get a good grade with this type of course (82 percent), again had the same significant relationships with the items on the questionnaire as students who liked self-pacing and did not prefer a traditional class. In addition, students who indicated that they did not believe that it was harder to get a good grade with self-pacing were less anxious about the course format.

A frequency distribution of final grades showed that 29 percent of the students in the survey received an "A", 39 percent received a "B", 27 percent received a "C", and 5 percent received lower than a "C". About 70 percent A's and B's has been the average for the past 15 years. The criterion-referenced system employed makes it theoretically possible and desirable for every student to earn an A. The retesting option also allows low scores to be removed from the student's record and not influence the final grade. Under the PSI philosophy, high grade distributions are expected. There was no difference in student's overall attitude about the self-paced statistics class for students receiving different final grades in the course ($F(2,71)=2.27, p>.10$).

CONCLUSIONS

Students in this study preferred the personalized system of instruction to a traditional lecture course. Like Robin (1976) and Smith (1987), the students in this study also had the most favorable attitudes about the opportunity for individual tutoring, the course grading system, and the components essential to a self-paced class.

Analysis of the data indicates that the overall positive attitude was not due to a final grade effect. These results were similar to what Lamal (1983) found. Regardless of what the student's final grade was, they generally had positive attitudes about the course components and structure.

When developing a PSI class, the characteristics of students that will be enrolled must be considered. More college students today are non-traditional students. They tend to be older, commute to classes, and have full-time jobs. PSI classes which design self-study resorces that are portable, are ideally suited for these students whose situations make it difficult to attend regular classes. PSI is also a good tool for removing a great deal of the threat associated with courses like statistics through its provision for self-pacing, retesting, and individualized tutoring. The self-pacing component also allows high-achievers to complete the course early, which is an attractive option for them, and frees the instructor to devote more time to low-achievers.

As PSI enters it's third decade, it still appears to be an attractive and viable alternative deserving of consideration by instructors. One reason for using it might simply be a desire for change; another might be the feeling that its methods are particularly well suited for a certain course. Given its appealing rationale and positive results, this study demonstrates that it can still be used effectively in college classes and in a variety of academic settings.

Table 1

Frequency Distribution of Item Responses

	ITEM	%AGREE	%DISAGREE	%NEUTRAL
1.	I am anxious about this type of course procedure.	50	46	4
2.	I like the idea of frequent testing.	90	6	4
3.	I feel confident that I am able to manage my time and progress through this course.	65	24	10
4.	The use of tutors and graduate assistants to help with the course is a good idea.	92	1	6
5.	I would much prefer a traditional lecture course with a midterm and final test.	18	70	12
6.	I like the idea of self-pacing.	74	6	19
7.	I am uncertain about how to study for a course like this.	15	79	6
8.	Being able to retest over a unit of instruction is a good idea.	97	0	3
9.	The grading system in this course is fairer to the student than in most lecture courses.	82	3	15
10.	I believe that I will get personal treatment from the instructor (or assistants) in this course.	90	2	8
11.	I think it will be harder to get a good grade under this type of system than a traditional one.	9	82	9
12.	This is the first self-paced course I have had.	82 YES	18 NO	
13.	What grade do you expect to earn in this course?	37 A	44 B	19 C
	Actual final grades.	29 A	39 B	27 C 5 D

TABLE 2

CORRELATION MATRIX

ITEM NUMBER		1	2	3	4	5	6	7	8	9	10	11
Anxious	1											
Freqtst	2	.074										
Time	3	**-.331**	.171									
Tutors	4	.033	.149	.095								
Trad	5	.187	-.121	**-.436**	.000							
Selfpace	6	-.179	**.278**	**.503**	.061	**-.794**						
Study	7	**.344**	-.046	**-.434**	.023	**.580**	**-.442**					
Retest	8	.121	.151	.087	.209	-.064	.136	-.050				
Fairgrade	9	.018	.205	.090	.140	-.144	.267	-.167	**.422**			
Personal	10	-.144	.117	**.287**	.171	**-.394**	**.320**	**-.484**	.270	.161		
Hard	11	**.336**	-.140	**-.421**	-.129	**.546**	**-.592**	**.403**	-.195	-.176	-.338	
Composite Score		**-.466**	**.324**	**.676**	.228	**-.765**	**.794**	**-.697**	**.294**	**.390**	.571	-.729

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